QUALIFICATION TESTS FOR SHOP WELDING

QUALIFICATION OF WELD PROCEDURES

Acceptability of welding procedures is based on the qualification requirements outlined in Section 5 of Bridge Welding Code D1.5. Welding procedures are required to be approved on an individual project basis.

WELDER QUALIFICATION

All welders, welding operators and tackers are required to be qualified before they will be permitted to weld on any bridge structure being built by the Iowa Department of Transportation. These qualification tests shall conform to the Bridge Welding Code AWS (American Welding Society) D1.5 as modified by the Iowa Department of Transportation Standard Specification as explained in these instructions.

The qualification herein specified for the welder, welding operator and the tacker shall be considered as remaining in effect from the end of the month in which the tests were taken, for a period of one year. The welding qualifications may be extended annually, based on a letter from the fabricator, which certifies that the welder has been engaged in the processes for which they qualify without interruption of more than six months during the preceding twelve months, or by requalification. Requalification will not be required every five years as previously required.

TEST PLATES

All test plates used in the qualification tests of the fabricator's personnel or procedure tests, regardless of the type or thickness, shall be furnished by the fabricator.

QUALIFICATION TESTS REQUIRED

The tests described herein are to determine the welder's ability to produce sound welds. The contracting authority, independent testing laboratories, or other governmental agencies shall witness the welding and conduct the tests required by the Bridge Welding Code to qualify the welding procedures and the welders, welding operators, and tackers who will apply these procedures. The name of the agency employee who witnessed the testing shall be included on the documents submitted to the Central Laboratory for approval.

Qualification tests for welders, welding operators and tackers shall be as follows:

1. Qualification Test for Unlimited Thickness

2. Qualification Test for Limited Thickness

3. Qualification Test for Fillet Welds Only

4. Qualification Test for Tackers

QUALIFICATION TEST FOR UNLIMITED THICKNESS

Joint detail as follows:

1. For manual and semi-automatic welders, 1 in.(25 mm) thick plate, single V groove, 45 degree included groove angle, ¼ in. (6 mm) root opening with backing. Minimum length of welding groove shall be 5 in. (125 mm). Figure 5.17 of AWS D1.5. There is an optional test plate for horizontal position unlimited thickness , Figure 5.18

2. For welding operators, 1 in. (25 mm) thick plate, single V groove, 20 degree included groove angle, ⅝ in. (16 mm) root opening with backing. Minimum length of welding groove shall be 15 in. (400 mm). Figure 5.24 of AWS D1.5

   Test Specimens – Two side bend tests.

This test will qualify the welder or welding operator for groove and fillet welds in material of unlimited thickness for the test position shown in the Paragraph, Position of Test Welds.

WELDER QUALIFICATION TEST FOR LIMITED THICKNESS

Joint detail as follows:

⅜ in. (10 mm) plate, single V groove, 45 degree included angle, ¼ in.(6 mm) root opening with backing. Minimum length of welding shall be 7 in. (180 mm). Figure 5.19 of AWS D1.5. There is an optional test plate for horizontal limited thickness. Figure 5.20.

Test Specimens – One face and one root bend specimen.

This test will qualify the welder for groove welds in material not over ¾ in. (20 mm) in thickness, and fillet welds on material of unlimited thickness for the test positions shown in the paragraph entitled Position of Test Welds.

QUALIFICATION TEST FOR FILLET WELDS ONLY

Welders:

Joint details as shown in Figure 5.21 or 5.22:(of AWS Code D1.5)

½ in. (12 mm) plate, T, minimum length of welding shall be 8 in. (200 mm).

Test Specimen – Fillet-Weld Break Specimen and Macroetch Specimen

OR:

⅜ in. (10 mm) plate, square butt, 15/16 in.(25 mm) root opening with backing. Minimum length of welding shall be 7 in.(180 mm).

Test Specimens – Two guided root bend specimens.

Welding Operators:

Joint details as shown in Figure 5.26 or 5.27:

1/2 in. (12 mm) plate, T, minimum length of welding shall be 15 in. (400 mm)

Test Specimen-Fillet-weld Break Specimen and Macroetch Specimen

OR:

3/8 in (10 mm) plate, square butt 15/16 in.(25 mm) root opening with backing.

Minimum length of welding shall be 15 in. (400 mm).

Test Specimens-Two guided root bend specimens.

A test will quality the welder or welding operator for fillet welding on material of unlimited thickness for the test position shown in the paragraph entitled Position of Test Welds.

QUALIFICATION TEST FOR TACKERS

Joint detail as follows:

½ in. (12 mm) plate 4 in. (100 mm) square placed on second plate of the same size ½ in. (12 mm) from edge to form a tee. Weld length 2 in.(50 mm). Figure 5.28 of AWS D1.5.

Test Specimen – Fillet-Weld Break Specimen

This test will qualify the tacker for fillet and groove tack welding on material of unlimited thickness for the test position below.

POSITION OF TEST WELDS

Qualification Test		Type of Weld & Position of Welding Qualified* Plate or Pipe	
Weld	**Plate** Position**	**Groove**	**Fillet**
Plate-Groove	1G	F	F,H
	2G	F,H	F,H
	3G	F,H,V	F,H,V
	4G	F.OH	F,H,OH
	3G &4G	All	All
Plate Fillet & Tackers	1F		F
	2F		F,H
	3F		F,H,V
	4F		F,H,OH
	3F & 4F		All

*Position of Welding; F=Flat, H=Horizontal, V=Vertical, OH=Overhead

**1G=Flat Groove, 2G=Horizontal Groove, 3G=Vertical Groove, 4G=Overhead Groove;
1F=Flat Fillet, 2F=Horizontal Fillet, 3F=Vertical Fillet, 4F=Overhead Fillet

RETESTS

In cases of test failures, a retest shall be allowed under the conditions outlined in AWS D1.5, Section 5, for that type of weld test.

VERTICAL WELDS

All vertical welds for grooves or fillets shall be made with the progression for all passes in the upward direction.

FILLER METAL

Refer to the Approved Brands Electrode List, published semi-annually, by the Iowa Department of Transportation Central Materials Office.

MINIMUM PREHEAT AND INTERPASS TEMPERATURE

TABLE 4.4 – MINIMUM PREHEAT AND INTERPASS TEMPERATURE
°F (°C)(Note 1)
(See 4.2)

Thickness of Thickest Part at Point of Welding – in(mm).

GROUP	Welding Process (Base Metal)	To 19 Included (¾)	Over 19 To 38 Included (¾ to 1½)	Over 38 To 63.5 Included (1½ to 2½)	Over 63.5 Over 63.5 Included (2½)
I/II	Shielded Metal-Arc Welding Submerged Arc Welding; Gas Metal-Arc Welding; or Flux-Cored Arc Welding (M270 [A709] GR36, 50, 50W)	10(50)	20(70)	65(150)	110(225)
IV	Shielded Metal-Arc Welding; Submerged Arc Welding; Gas Metal-Arc Welding; or Flux Cored Arc Welding (M270 [A709] GR 70W, 100 100W)(Note 2)	10(50)	50(125)	80(175)	110(225)

Note 1: See Appendix VIII and Tables 12.3, 12.4, and 12.5 (of the AWS D1.5) for alternate preheat and interpass temperatures.

Note 2: For M270 (A709) Gr. 70W, 100, 100W, the maximum preheat and interpass temperature shall not exceed 400°F (205°C) for thicknesses up to 1½ in.(38 mm) inclusive, and 450°F(230°C) for greater thicknesses.